MINERAL RESOURCES OF GEORGIA.

Mineral Resources of Georgia and Caucasia: Manganese Industry of Georgia. By D. Ghambashidze. Pp. 182. (London: George Allen and Unwin, Ltd.; New York: The Macmillan Co., 1919.) Price 8*s.* 6*d.* net.

THIS little book is interesting as being the outcome of the reorganisation of national boundaries after the war and as evidence of the political and economic independence of the new Republic of Georgia; this was an independent kingdom until it was forcibly annexed by Russia in 1801, and only recommenced its autonomous existence in 1917. The object of the work now published by Mr. Ghambashidze is to make British readers acquainted with the industrial importance of Georgia and Caucasia so far as the mineral wealth of this region is concerned. The author gives a long list of the various mineral substances of economic value known to occur therein, although relatively few have been worked on an industrial scale.

The oilfields of Caucasia have long been known, the principal field, that of Baku, having been for many years one of the world's great producers, with an annual (pre-war) output of about 7 million tons of petroleum. Next in importance comes that of Grozny, with a production of 1–1½ million tons, and there are also several smaller ones, the output from which is at present negligible; even the Maikop field, the first borings in which aroused so much excitement, has sunk to a quite unimportant factor in the general production. Of the other non-metallic minerals, bitumen is at present the most important, though the sulphur deposits in the province of Erivan, 30 miles from a railway line, may prove to be of value in the near future.

Of the metallic minerals, a few deposits of iron-ore are known, but none apparently of great importance. There are several known deposits of blende and galena, but only one, a mine at Sadon, is being worked at present; it is in the hands of a Russo-Belgian company, the Société Minière et Chimique Alagir. Copper is abundant and has been worked in many parts of Georgia and Caucasia. The best known of all is the Kedabek mine at Mis-Dag, which was an important producer up to about 1912, when the deposits began to show signs of exhaustion, so that the present output is barely 100 tons of copper per annum, whereas it was at one time up to 1750 tons. Altogether there were in 1914 some twenty-eight copper mines at work, fourteen of which had their own smelters; the total production of copper in 1914 was 8259 tons. The most important of the metalliferous minerals is manganese ore. In addition to a number of deposits in various parts of Georgia, which are not being worked at present, and are briefly referred to, the well-known deposits in the province of Kutais, which cover an area of 400 square miles and are estimated to contain 200 million tons of available ore, are described in some detail. The exports of this ore from Georgia had reached more than a million tons in 1913, but then fell off rapidly owing to the war. There appears to be no reason why this industry should not again recover its previous importance. The book contains a valuable amount of statistical information carefully tabulated, showing the mineral production of the districts treated of, and should be of use to all engaged in the mineral industry of the Near East.

H. L.

OUR BOOKSHELF.

A Simple and Rapid Method of Tide Prediction. (Including Diurnal Time and Height Inequalities.) By Sgt. M. E. J. Gheury. Pp. 53. (London: J. D. Potter, 1919.) Price 5*s.*

IN this little book the author explains the method which he developed for predicting the time and height of high and low water at Richborough, on the River Stour (Kent). From observations of these variables, extending over a fortnight only (in the first instance), it proved possible to deduce satisfactory predictions with but little trouble. The method has a rational basis, which is described in a preliminary account of the tide-producing forces and their variations. The work involved is partly graphical and partly tabular, but no harmonic analyses are required. The aim is to replace the unsatisfactory method by which a set of corrections is applied to the high- and low-water data for the nearest standard port, which at some stations may be as much as 200 miles away. In the present case the nearest standard port was only 20 miles away (Dover), but even in this instance Mr. Gheury's method, applied to deduce times of high water, gave better results than did the application of a correction to the elaborately derived Dover data. Richborough, being situated several miles up a narrow and sinuous tidal stream opening in a bay, presents some rather complex tidal features, including well-marked diurnal height and time inequalities; the success of the method, which can readily be applied to other similar or simpler stations, is therefore the more significant. The book is marred by some irritating misprints and grammatical errors, but the explanations are, on the whole, correct and lucid.

Fermat's Last Theorem: Three Proofs by Elementary Algebra. By M. Cashmore. Revised edition. Pp. 55. (London: G. Bell and Sons, Ltd., 1918.) Price 2*s.* 6*d.* net.

IT is unfortunate that F. P. Wolfkehl's legacy of a prize for settling the vexed question of "Fermat's Last Theorem" should have stimulated such a large erroneous mathematical literature. Most of the publications pretending to prove the theorem are deplorable for at least three reasons: first, because many of their authors have had insufficient mathematical training to enable them to decide whether a supposed proof is sound or not; secondly, because of the expense incurred by the authors in printing invalid proofs; and

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thirdly, because useless publications increase the burden of librarians and scholars. We are far from wishing to discourage genuine attempts to reproduce Fermat's line of thought. In view of the state of mathematical knowledge 250 years ago, Fermat's proof, assuming it to be correct—a point on which expert opinions differ—is as likely to be discovered by a clever schoolboy of seventeen as by a more highly trained mathematician.

Mr. Cashmore, in the tract before us, presents three distinct "proofs," all erroneous. In I. (p. 14) he states that when

$$ax^2+by^2=w^n, \text{ then } w=au^2+bv^2,$$

the letters denoting ordinary integers. A numerical example is enough to show that this is erroneous; thus

$$2^2+5\cdot1^2=3^2, \quad 11\cdot2^2+9^2=5^3;$$

but there are no integral solutions of

$$x^2+5y^2=3, \quad 11x^2+y^2=5.$$

The first of several fallacies in II. occurs on p. 26, and in III. (p. 43) Mr. Cashmore states that when $(p^n-q^n)y^{n-1}$ is divisible by pq, then y is divisible by pq, it being assumed that p and q are integers with no common factor It is seen that this deduction is erroneous by taking

$$p=9, \ q=4, \ y=6, \ n=3.$$

W. E. H. B.

Secrets of Animal Life. By Prof. J. Arthur Thomson. Pp. viii+324. (London: Andrew Melrose, Ltd., 1919.) Price 7*s*. 6*d*. net.

THIS is a collection of forty essays, contributed during recent years by Prof. Thomson to the *New Statesman*, and now collected in a handy and attractive volume. In his own clear and charming style the author seeks "to interest thoughtful readers in the multitudinous problems of animal life," and he wisely enforces the lesson that, in many cases, the solutions of these problems are "secrets" still. Such familiar subjects as the habits of rooks and cuckoos or the "Fall of the Year" are mixed with review-summaries of noteworthy recent zoological literature of general interest such as Watson and Lashley's observations on the "homing" of terns, Emery's researches on the habits of Amazon ants, or Petersen's surveys of the Zostera-beds off the coasts of Denmark. The problems of inheritance and evolution are prominent, as might be expected, and from such papers as "With Darwin Forwards" and "The Mendelian Clue," the "thoughtful reader" may gain a clear introductory view of the fields of biological inquiry, as well as guidance in the way of deeper study. Prof. Thomson never misleads those for whom he writes by implying that after reading him they have no more to learn; his treatment of "The Problem of Cave Blindness," for example, affords a needed corrective to wide-spread dogmatism on a subject that has appealed to popular imagination since the early days of evolutionary biology.

G. H. C.

LETTERS TO THE EDITOR.

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International Relations in Science.

I DO not agree with the proposals made by Prof. D'Arcy Thompson in NATURE of October 23. I think that the less our academies and societies move in this matter the better. For my own part I objected altogether to the proposal made during the war to strike off our records the names of distinguished men of enemy nationality who had been elected "foreign members" before the war. They had not been admitted to any power or rights in consequence of that election, and it was, in my judgment, futile and petty to endeavour to obliterate the record of the honour which had been justly accorded to them.

As to making overtures to, and the reception of overtures from, the academies of those hostile nationalities with which peace is not yet ratified, it seems to me that our own societies and academies should at present neither offer nor accept any such overtures. They are mere formalities and demonstrations without any real significance or value, and must be, and are often designed to be, misleading. On the other hand, I think every individual should act according to his own feeling and judgment, and not according to mass sentiment, in regard to entering into friendly relations with German men of science. At present I personally could not accept such relations. I wish to reserve all action in the matter until my memory of many things has faded. But I will never wittingly treat even those whom I most dislike with less than justice tempered by generosity.

E. RAY LANKESTER.

The Response of Plants to Wireless Stimulation.

A GROWING plant bends towards light; this is true, not only of the main stem, but also of its branches and attached leaves and leaflets. This movement in response is described as the tropic effect of light. Growth itself is modified by the action of light: two different effects depending on the intensity are produced; strong stimulus of light causes a diminution of rate of growth, but very feeble stimulus induces an acceleration of growth. The tropic effect is very strong in the ultra-violet region of the spectrum with its extremely short wave-length of light; but the effect declines practically to zero as we move towards the less refrangible rays, the yellow and the red, with their comparatively long wave-length. As we proceed further in the infra-red region we come across the vast range of electric radiation, the wave-lengths of which vary from the shortest wave I have been able to produce (0·6 cm.) to others which may be miles in length. There thus arises the very interesting question whether plants perceive and respond to the long æther-waves, including those employed in signalling through space.

At first sight this would appear to be very unlikely, for the most effective rays are in the ultra-violet region with wave-length as short as 20×10^{-6} cm.; but with electric waves used in wireless signalling we have to deal with waves 50,000,000 times as long. The perceptive power of our retina is confined within the very narrow range of a single octave, the wave-lengths of which lie between 70×10^{-6} cm. and 35×10^{-6} cm. It is difficult to imagine that plants could perceive radiations so widely separated from each other as the visible light and the invisible electric waves.

But the subject assumes a different aspect when we

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